



Office of Air and Radiation
Office of Air Quality Planning and Standards
Innovative Strategies and Economics Group

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**REGULATORY IMPACT ANALYSIS FOR
THE SPECIFICATION OF CATEGORIES
OF ACTIVITIES AS ROUTINE
MAINTENANCE, REPAIR AND
REPLACEMENT FOR THE NEW SOURCE
REVIEW PROGRAM**

prepared by

Daniel Mussatti, Senior Economist
Innovative Strategies and Economics Group
Air Quality Strategies and Standards Division



Executive Summary

Under the changes promulgated to 40 CFR parts 51 and 52, “major modification” is defined as any physical change in or change in the method of operation of a major stationary source that would result in: (1) a significant emissions increase of a regulated new source review (NSR) pollutant; and (2) a significant net emissions increase of that pollutant from the major stationary source. Owners or operators of major stationary sources (sources) are required to obtain a major NSR permit prior to beginning actual construction of a modification that meets this definition. The regulations exclude certain activities from the definition of “major modification.” One such exclusion is for routine maintenance, repair and replacement (RMRR) activities. The regulations do not define this term.

Under our current approach, the RMRR exclusion is applied on a case-by-case basis using a multi-factor test. In interpreting this exclusion, we have followed certain criteria. The preamble to the 1992 “WEPCO Rule” (57 FR 32314) and applicability determinations made to date describe our current approach to assessing what activities constitute RMRR. This approach is known as the multi-factor test. This proposed rulemaking changes the major NSR program by providing specific categories of activities that EPA will consider RMRR in the future.

The proposal provides two approaches that reviewing authorities will consider for identifying RMRR activities in the future: an annual maintenance, repair and replacement allowance, and an allowance for certain equipment replacement. When an activity falls within either of these categories, then EPA would consider it to be RMRR and a source would know that it was excluded from major NSR without regard to other considerations. When an activity does not fall within one of these categories, then it still could qualify as routine maintenance, repair, and replacement under the multi-factor test.

The approaches would exclude from major NSR applicability: 1) activities at a stationary source whose total costs fall below specified thresholds set so as to cover RMRR capital and non-capital costs incurred to maintain, facilitate, restore, or improve the safety, efficiency, availability or reliability of the operation of the stationary source; and, 2) the replacement of existing equipment with equipment that serves the same function and that does not alter the basic design parameters of a unit, provided the cost of the replacement equipment does not exceed a certain percentage of the cost of the process unit to which the equipment belongs. Such categories would remove disincentives to undertaking RMRR activities and provide more certainty both to the industry, who could better plan activities at their facilities, and to reviewing authorities, who could better focus resources on activities outside these RMRR categories. The Agency may decide to promulgate both approaches or just one of the two approaches.

There are fundamental limitations on the ability to do a full quantitative analysis of the effects of the proposed rule. The proposed approaches are being made available as options that sources may exercise at their

discretion. Because a source's decision whether and when to exercise a voluntary option is a highly case-specific decision, dependent on a number of factors including other regulatory programs, EPA is unable to model overall industry behavior in responding to the proposed approaches.

We have attempted to quantitatively analyze the possible emissions consequences of the approaches to the RMRR exclusion described above. The analysis was conducted using the Integrated Planning Model (IPM) which is a powerful model that covers the entire power industry. We do not have such a model for other industries but believe that the results for the electric utilities accurately reflect the trends we would see in other industries.

The analysis looks at the potential impacts of a "narrow" RMRR exclusion (e.g., less activities identified as RMRR) and "broader" RMRR exclusions (e.g., more activities identified as RMRR). The analysis is meant to bound the potential effects of the range of approaches proposed. It is difficult to be certain that such an analysis can truly bound the potential improvements in energy efficiency and emissions reductions which may be realized by a "broader" RMRR exclusion.

We also considered similar analyses for the power sector conducted by the Department of Energy (DOE). The DOE used a complex model called the National Energy Modeling System (NEMS). Although NEMS and IPM do not employ exactly the same analytical methods, we consider the results from both models to be comparable and useful in examining our proposed rule.

The analyses generally concluded that the breadth of the RMRR exclusion would have little impact on the emissions reductions that will be achieved in the future under the major NSR program. The analyses showed that emissions of sulfur dioxide (SO₂) are essentially the same under all scenarios. This stands to reason because nationwide emissions of SO₂ from the power sector are capped by the title IV Acid Rain Program. For nitrogen oxide (NO_x), the analyses showed small relative decreases in some cases and small relative increases in other cases. These predicted changes represent only a relatively small fraction of nationwide NO_x emissions from the power sector, which hover around 4.3 million tons per year.

The analyses do not consider changes in maintenance costs, they only assumes changes in fuel costs and changes in capital costs associated with new generating units and new emission control equipment. Therefore, the analyses probably understate the cost of the increased maintenance scenarios and understate the cost of the major NSR base case. In addition, there would be reduction in the costs to industry and reviewing agencies, due to decreases in making applicability determinations, associated with identifying categories of activities that are RMRR.

1 Introduction

1.1 Purpose

The purpose of this document is to provide information on the potential costs and benefits of the proposed modifications to the major NSR routine maintenance, repair and replacement program.

New Source Review is one of many programs created by the Clean Air Act to control or reduce emissions of criteria air pollutants emitted from a wide variety of sources and have an adverse impact on human health and the environment. Other key programs include: the title IV Acid Rain Program, Maximum Achievable Control Technology (MACT) and other air toxics standards for control of Hazardous Air Pollutants (HAPs), New Source Performance Standards, the 22-state NO_x “SIP call”, the Regional Haze program, numerous mobile source programs, and the basic state and local air control programs to attain and maintain the National Ambient Air Quality Standards (NAAQS). Together, these programs have achieved, and will continue to achieve, tens of millions of tons per year of reductions that are independent of any effects of the major NSR program.

While the programs discussed above play the dominant role in reducing emissions of air pollution, the major NSR program assures that when the construction of new major sources of pollution or major modifications at existing sources occur, the emissions that result from that construction or modification are well-controlled and are permitted consistent with these programs.

This document supports the Agency's requirements under the various Acts and Executive Orders governing the analysis of regulations, including (but not limited to) the requirements discussed below in section 2 of this analysis with regards to determining the regulatory burden associated with the proposed change to the major NSR program to provide a clear category of activities that will be considered routine maintenance, repair, and replacement under the major NSR program.

1.2 Introduction

Currently, the Agency interprets and applies its major New Source Review (major NSR) exclusion for sources performing routine maintenance, repair and replacement (RMRR) on a case-by-case basis. The rulemaking provides two approaches that reviewing authorities will consider for identifying RMRR activities in the future: an annual maintenance, repair and replacement allowance, and an allowance for certain equipment replacement of identical or functionally equivalent equipment. When an activity falls within either of these categories, then EPA would consider it to be RMRR and a source would know that it was excluded from major NSR without regard to other considerations. When an activity did not fall

within one of these categories, then it still could qualify as routine maintenance, repair, and replacement under the multi-factor test.

This paper presents an overview of the impacts of the proposed identification of categories of activities as routine maintenance, repair, and replacement (RMRR) within the framework of the major NSR preconstruction permit program. To perform this analysis, the Agency relied heavily upon existing reports on file for various aspects of the major NSR program, including the June 2002 Report to the President,¹ the major NSR Review Background Paper,² the current major NSR Information Collection Request (ICR),³ the ICRs submitted in May and June for revisions to the major NSR applicability requirements and the proposed RMRR program,^{4, 5} and their associated Federal Register notices and other public announcements.

1.3 The Current NSR Program

The major NSR program is a combination of air quality planning and air pollution control technology program requirements for new and modified major stationary sources of air pollution. Section 109 of the Clean Air Act Amendments of 1990 (CAAA) requires EPA to promulgate primary National Ambient Air Quality Standards (NAAQS) to protect public health and secondary NAAQS to protect public welfare. Once EPA has set these standards, states must develop State Implementation Plans (SIPs) that contain emission limitations and other control measures to attain and maintain the NAAQS and to meet the other requirements of section 110(a) of the Act. The major NSR program is a part of that SIP requirement.

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- 1** U.S. EPA, 2002, "New Source Review: Report To the President," <http://www.epa.gov/air/nsr-review/background.html>
 - 2** U.S. EPA, 2001, "NSR 90-Day Review Background Paper," Docket A-2001-19, Document Number II-A-01, <http://www.epa.gov/air/nsr-review/background.html>
 - 3** U.S. EPA, 2001, "Information Collection Request for 40 CFR Part 51 and 52 Prevention of Significant Deterioration and Nonattainment New Source Review," OMB Control Number 2060-0003; EPA Form Number 1230.09.
 - 4** U.S. EPA, 2002, "Information Collection Request for Changes to the 40 CFR Parts 51 and 52 PSD and NSR Applicability Requirements for Modifications to Existing Sources," EPA Form Number 2074.01.
 - 5** U.S. EPA, 2002, "Information Collection Request for the Establishment of a Definition of Routine Maintenance, Repair and Replacement for the New Source Review Program," EPA Form Number 1713.04.

The program commonly called “major NSR” derives its authority from parts C and D of Title I of the Act and is a preconstruction review and permitting program applicable to new or modified major stationary sources of air pollutants. In areas not meeting the NAAQS and in the ozone transport regions (OTR), the program is the "nonattainment" major NSR program, implemented under the requirements of part D of title I of the Act. In attainment areas (areas meeting NAAQS) or in areas where there is insufficient information to determine whether they meet the NAAQS ("unclassifiable" areas), the Agency implements major NSR as the Prevention of Significant Deterioration (PSD) program under the requirements of part C of Title I of the Act. Applicability of the major NSR program must be determined in advance of construction and is pollutant-specific. When a source triggers major NSR in attainment areas, it must install best available control technology (BACT) and conduct modeling and monitoring as necessary. If the source is located in a nonattainment area, it must install technology that meets the lowest achievable emission rate (LAER), secure emission reductions to offset any increases above baseline emission levels, and perform other analysis.

1.4 RMRR - Background

The modification provisions of the major NSR program in parts C and D are based on the definition in section 111(a)(4) of the Act:

"... [‘modification’ means] . . . any physical change in, or change in the method of operation of, a stationary source which increases the amount of any air pollutant emitted by such source or which results in the emission of any air pollutant not previously emitted."

That definition involves a two-step test for determining whether source activities constitute a modification subject to major NSR requirements: the source determines whether a physical or operational change will occur and then determines whether the change will result in (1) a significant emissions increase of a regulated pollutant from a combination of one or more emissions units following the physical or operational change; and (2) a significant net emissions increase of that pollutant from the major stationary source over the contemporaneous period.

Under the changes promulgated to 40 CFR parts 51 and 52, “major modification” is defined as any physical change in or change in the method of operation of a major stationary source that would result in: (1) a significant emissions increase of a regulated new source review (NSR) pollutant; and (2) a significant net emissions increase of that pollutant from the major stationary source. Owners or operators of major stationary sources are required to obtain a major NSR permit prior to beginning actual construction of a modification that meets this definition. The

regulations exclude certain activities from the definition of “major modification,” including activities that constitute RMRR.

Currently, the RMRR exclusion is interpreted and applied on a case-by-case basis. The current process still “imposes significant burdens on the utility practices necessary to maintain the safety, availability, efficiency and reliability of the electricity supply at existing sources. . .[and] the current NSR program has actively discouraged efficiency improvement projects . . .”^{6 7} For example, the 2001 NSR 90-Day Report cites the following anecdotal evidence:

“ . . .past blade maintenance and replacement of only the deteriorated blades at Detroit Edison has never increased efficiency over the original design. Yet because [blade upgrade] would result in substantially improved efficiency compared to the original design, EPA considered it a physical change under its NSR regulations, and [therefore] subject to NSR. . .”⁸

Another major problem inherent in the current major NSR system is regulatory delay. Since 1997, the average time needed to obtain a major NSR or PSD permit, across all industries, is about seven months.⁹ The average time needed to make a maintenance-related NSR determination is between thirty and sixty days. The National Petroleum Council (NPC) reported in June 2000 that the lengthy process for obtaining permits can limit a refinery’s ability to respond quickly to changing market conditions. They offered the following list of average regulatory delays, based upon surveys of its members:

- 3-6 months to prepare a permit application
- 1-3 months for the reviewing authority to deem the application complete
- 3-6 months for the development and negotiation of a draft permit
- An unstated period for public notice and the opportunity to receive public comments on the draft permit
- An unstated period of time for the reviewing authority to respond to public comments and take final action on the permit¹⁰

6 U.S. EPA 2002, “New Source Review: Report To the President,” p 8.

7 The discussion applies equally to industrial sources.

8 U.S. EPA, 2001, “NSR 90-Day Review Background Paper,” p 28.

9 Ibid. p 7.

10 Ibid. p 44.

Note that these examples do not address only routine maintenance. Relying on the results of the NPC survey, the entire process of merely getting approval to make a routine modification would require a minimum of year. Then, if the determination indicated the activity required major NSR permitting, the source would have to wait once more for its permit to be approved before beginning the repair. In other words, a source may have to wait for up to eighteen months to be able to make a repair because it triggers major NSR permitting. Obviously, if such a routine change is warranted in response to changing market conditions, then such delay would threaten a company's ability to operate effectively in the market. One of the goals of the rulemaking on the routine maintenance, repair and replacement exclusion is to allow for the exclusion to be implemented without such delays.

EPA proposes modifying the RMRR exclusion to explicitly include activities with total costs below an annual maintenance, repair, and replacement allowance for a unit. The annual maintenance, repair, and replacement allowance and the rules for calculating and summing projects under the allowance would be defined in new provisions at 40 CFR 51.165 (a) (1) (xxvi), 40 CFR 51.166 (b) (38), 40 CFR 52.21 (b) (39), and 40 CFR 52.24 (f) (25). Under EPA's first approach a maintenance, repair, and replacement allowance would be established for each facility for each pre-defined year (typically a calendar year or fiscal year). The costs of projects incurred during the calendar year would be summed across all units regardless of the pollutant it emits from least expensive to most expensive to get a total yearly cost for a unit. Facilities with total RMRR-related costs below the annual maintenance, repair, and replacement allowance would be considered to have undertake only routine maintenance, repair and replacement activities for those projects in its annual report. When a facility's total yearly reported cost exceeds the annual maintenance, repair, and replacement allowance, the activities would be reviewed as follows:

- The owner/operator would subtract projects from the total yearly cost, starting with the most expensive project, until the remainder is less than or equal to the annual maintenance, repair, and replacement allowance.
- Projects that were removed from the total yearly cost would be evaluated according to the multi-factor test in accordance with current EPA policy.
- Any removed project found to require major NSR permitting through the *ex post* case-by-case review would be subject to major NSR.

The Agency would establish the annual maintenance, repair, and replacement allowance equal to the product of the replacement cost of the unit and a specified maintenance percentage established in the proposed

rule, where replacement cost is defined as the total capital investment necessary for the complete replacement of the unit, calculated according to the EPA's cost methodology, set out in the EPA Air Pollution Control Cost Manual, (excluding the costs for installing and maintaining pollution control equipment).¹¹ When a stationary source uses the annual maintenance, repair, and replacement allowance to determine RMRR activities, all projects must be included in the annual cost calculations.

Under the first approach, facilities must submit an annual report, aggregated across all units at the facility, to the appropriate reviewing authority (RA) within 60 days of the end of the year over which project costs have been summed. Each report must provide a summary of the estimated replacement value of each unit, the aggregated annual maintenance, repair, and replacement allowance for the facility, a description of all changes made to each unit, and the costs associated with those projects.

EPA's recommended approach will also contain safeguards to help ensure that projects that should be considered a major modification under the regulations are ineligible for exclusion from major NSR under the annual maintenance, repair, and replacement allowance. EPA proposes excluding from use of the annual maintenance, repair, and replacement allowance:

1. **The installation of a new process unit.** The types of activities eligible for an automatic RMRR exclusion should be limited to maintenance of existing process units at a stationary source in order to ensure continued safe and reliable operation. The addition of new process units that did not previously exist should receive greater scrutiny before a determination of routineness is made.
2. **The replacement of an entire process unit.** The replacement of an entire process unit should not be automatically considered routine since a variety of operating parameters could change. Therefore, a wholesale exchange of a process unit should be subject to greater scrutiny under the major NSR program.
3. **Any change that would result in an increase in short term emission rates of any regulated pollutant, or in the emission of any regulated pollutant not previously emitted.** Any activity that will result in a higher emission rate or the emission of a new pollutant should not be automatically considered routine as these increases may result in a significant net emissions increase or may have a significant impact on the environment.

11 The EPA Air Pollution Control Cost Manual, 6th Edition, Daniel Mussatti, ed., January 2002, EPA #452-B-02-001, Section 1, Chapter 2.

Concomitant with the proposed annual maintenance, repair, and replacement allowance approach, the Agency developed a second approach to the management of RMRR activities that focuses on clarifying when the replacement of existing equipment with equipment that serves the same function and that does not alter the basic design parameters of a unit would be considered RMRR. Under this approach, EPA would establish a percentage (yet to be determined) of the replacement value of a process unit as a per-project threshold for applying the RMRR exclusion in a fashion similar to that employed for New Source Performance Standards (NSPS) purposes. This approach would let sources determine more readily what large-scale replacement activities would or would not trigger major NSR permitting. The equipment replacement approach would apply to the replacement of existing equipment with either identical new equipment or with functionally equivalent equipment.

While the annual maintenance provisions described above will improve implementation of the RMRR exclusion, the allowance applies primarily to lower cost, short turn-around activities. For large scale projects that should qualify for an RMRR exclusion, the current multi-factor test and the proposed annual maintenance, repair, and replacement allowance approach may not provide sufficient relief. The current approach requires complex analysis to decide whether or not proposed projects (the same projects that would not meet the annual maintenance, repair, and replacement allowance criteria) constitute RMRR. Sources must choose between proceeding without a permit (with all of the potential liabilities of noncompliance) or seeking an applicability determination, which delays major source NSR project implementation by a minimum of six months. Given such a choice, it is not surprising that the Agency has amassed anecdotal evidence showing that the uncertainty about the exemption for routine activities has resulted in expensive delays or even the cancellation of beneficial projects. Such regulatory discouragement results in lost productive capacity, as well as lost opportunities to improve energy efficiency and reduce air pollution.

Sources are not the only entities that incur costs from such determinations. State and local reviewing authorities must devote scarce resources to make complex determinations, consult with other agencies to ensure their determinations are consistent with decisions made for similar circumstances in other jurisdictions (and the EPA), and confer with other regulators to ensure consistency among the RA's conclusions.

1.6 Analytical Considerations

While the Agency proposes a single RMRR approach that combines elements of both alternatives, the exact nature of that combined approach cannot be determined at this time. Consequently, the Agency had to make an important limiting assumption with regard to our burden analysis by

assuming the two approaches are mutually exclusive and that one or the other of the approaches - but not both - will be present in the final rule. Furthermore, in considering each alternative separately, the conclusions of the analysis cannot be considered to be upper or lower bounds on the benefits or costs that may accrue to affected entities because the Agency will select the best of both alternatives when designing its hybrid program and, therefore, believes the sum will be greater than its parts, expanding benefits beyond either program individually and reducing costs below those reported for either alternative.

The results of the EPA's analysis are found below.

2 Needs and Consequences

This part of the qualitative analysis summarizes the statutory requirements affecting the development of a Federal major NSR program and describes the nature of the problem. The need for regulatory action and the consequences of the regulation in terms of improving the functioning of the market are also discussed.

2.1 Nature of the Problem

In the absence of government regulation, market-oriented economic systems typically fail to prevent elevated levels of pollution in the environment because the environment is a public good. More specifically, individual sources treat the assimilative capacity of the environment as a "free good" resource to dispose of unused byproduct emissions. Under these conditions, emitters of pollutants and pollutant precursors do not internalize the cost of damages created by their own emissions. These damages occur to society as a whole, rather than to specific members of society. This is because pollution emissions are non-market goods -- goods not bought or sold in the marketplace -- and the atmosphere carries with it no property rights. The damages of pollution include increased morbidity and mortality; property damage from soiling, staining, and corrosion; and productive loss due to decreased worker efficiency, crop and livestock damage, and increased wear and tear on capital stocks. All of these damages are measurable. In addition, there are damages caused by pollution that are much harder, if not impossible, to quantify. These damages include habitat loss, diminished biodiversity, reductions in aesthetic quality, option values, and existence values.

The divergence between the private cost of production and the social cost of production occur because the source does not bear the full cost of its activities (market costs plus damages). The outcome of the cost divergence is market failure, where as described in this case, the level of output is such that marginal social benefits are not equal to marginal social cost. The result is economic inefficiency, or a mis-allocation of society's resources; the polluting activity (e.g., the release of ozone precursors) occurs at too high a level in comparison to the optimally efficient situation, thus reducing the potential total benefits to society. Regulatory strategies attempt to correct for the divergence between social and private costs. Using regulatory strategies to internalize the negative externality may not, however, result in zero air pollution. Economic efficiency calls for abatement up to the point where additional abatement would cost more than the additional benefits would be worth to society.

In addition to government regulation, other potential mechanisms may be used to correct for the negative externality brought about by air pollution. Negotiations or litigation under tort and common law, in

theory, could result in compensation to persons for the damages that they incur. However, two major obstacles block the correction by the private market for pollution-based inefficiencies and inequities. The first obstacle is high transaction costs when millions of persons are affected by millions of pollution sources. Transaction costs of compensating those adversely affected arise and accumulate because the current and future injury to each individual must be appraised, the injury must be apportioned to each precursor source, and damage suits or negotiations must be conducted. In an unregulated market, each source of precursor emissions and each affected person would have to litigate or negotiate. The transaction costs would be so high as to probably exceed the benefits of reduced air emissions. These obstacles strongly suggest that another mechanism is desirable for solving air pollution problems.

The second obstacle discouraging resolution by the private sector is due to the public good nature of air resource. That is, after emission reductions have been achieved, the benefits of cleaner air can be enjoyed by additional persons at no additional cost. This results in the classic "free rider" problem. Everyone would have an incentive to be the last to contribute resources for litigation or negotiation, thinking that he or she would freely benefit from the efforts of others. While regulatory intervention can mitigate the impacts of the types of market failures discussed above, they generally do not occur without imposing their own costs. Typically, these costs include administration, enforcement, and the redistribution of resources at all levels. However, secondary impacts on social and economic sub-groups of the economy can also be affected in a disproportionate manner. The purpose of this report is to analyze, identify, and mitigate these regulatory costs.

2.2 Legislative Requirements

This section describes various legislative and executive requirements that govern the analytical requirements for Federal rulemakings, and describes how each analytical requirement is addressed in this RIA.

2.2.1 Executive Order 12866

Executive Order 12866, "Regulatory Planning and Review" (FR, 1993), supercedes Executive Order 12291 "Federal Regulation" of 1981. It requires EPA to provide the Office of Information and Regulatory Affairs of the Office of Management and Budget (OIRA, OMB) with an assessment of the costs and benefits of significant regulatory actions. A "significant regulatory action" is defined as "any regulatory action that is likely to result in a rule that may:

- Have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the

economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order" (FR, 1993).

For any such regulatory action, the Agency must provide a statement of the need for the proposed action, must examine alternative approaches, and estimate social benefits and costs.

It has determined that the proposed change to the RMRR exclusion constitutes an economically significant regulatory action. The Agency recognizes the importance of the major NSR program and its effort to streamline and simplify its processes. Consequently, this RIA has been prepared to provide updated economic cost and benefits information required by E.O. 12866 for a significant regulatory action.

2.2.2 Executive Order 12898

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires federal agencies to consider the impact of programs, policies, and activities on minority populations and low-income populations. Disproportionate adverse impacts on these populations should be avoided. According to EPA guidance, agencies are to assess whether minority or low-income populations face risk or a rate of exposure to hazards that is significant (as defined by the National Environmental Policy Act) and that "appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group." (EPA, 1996b) This guidance outlines EPA's Environmental Justice Strategy and discusses environmental justice issues, concerns, and goals identified by EPA and environmental justice advocates in relation to regulatory actions.

In general, the potential for disproportionate effects on minority and low-income populations in the major NSR program come from siting issues. However, by definition, the RMRR component of the major NSR program deals exclusively with existing facilities.

2.2.3 Executive Order 13045

Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks," directs Federal agencies developing health and safety standards to include an evaluation of the health and safety

effects of the regulations on children. Regulatory actions covered under the Executive Order include rulemakings that are economically significant under Executive Order 12866, and that concern an environmental health risk or safety risk that the Agency has reason to believe may disproportionately affect children. EPA has developed internal guidelines for implementing the E.O. 13045. (EPA, 1998b) The Agency does not have reason to believe the environmental health risks or safety risks addressed by this action present a disproportionate risk to children.

2.2.4 Executive Order 13132

Executive Order 13132, entitled Federalism (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. "Policies that have federalism implications" is defined in the Executive Order to include regulations that have "substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government." Under Executive Order 13132, EPA may not issue a regulation that has federalism implications, imposes substantial direct compliance costs, or that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, or EPA consults with State and local officials early in the process of developing the proposed regulation. EPA also may not issue a regulation preempts State law unless the Agency consults with State and local officials early in the process of developing the proposed regulation.

If EPA complies by consulting States and local governments, Executive Order 13132 requires EPA to provide to OMB, in a separately identified section of the preamble to the rule, a federalism summary impact statement (FSIS). The FSIS must include a description of the extent of EPA's prior consultation with State and local officials, a summary of the nature of their concerns and the agency's position supporting the need to issue the regulation, and a statement of the extent to which the concerns of State and local officials have been met. Also, when EPA transmits a draft final rule with federalism implications to OMB for review pursuant to Executive Order 12866, EPA must include a certification from the Agency's Federalism Official stating that EPA has met the requirements of Executive Order 13132 in a meaningful and timely manner.

The proposed change to the RMRR exclusion under the major NSR program will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of

government, as specified in Executive Order 13132. As discussed above, this rule imposes only minimal compliance burdens beyond those already included in the major NSR program. Thus, the requirements of section 6 of the Executive Order do not apply to this rule.

2.2.5 Executive Order 13084

Under Executive Order 13084, "Consultation with Tribal Governments," EPA may not issue a regulation not required by statute that significantly or uniquely affects the communities of Indian tribal governments, or that imposes substantial direct compliance costs on those communities, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by the tribal governments, or EPA consults with those governments. If EPA complies by consulting these governments, Executive Order 13084 requires EPA to provide to OMB in a separately identified section of the preamble to the rule, a description of the extent of EPA's prior consultation with representatives of affected tribal governments, a summary of the nature of their concerns, and a statement supporting the need to issue the regulation. In addition, Executive Order 13084 requires EPA to develop an effective process permitting elected and other representatives of Indian tribal governments "to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities."

This proposed change in the major NSR program does not significantly or uniquely affect the communities of Indian tribal governments. As discussed above, this rule imposes only minimal new compliance burdens beyond those already required by the major NSR program. Moreover, the final Section 126 rule will not impose substantial direct compliance costs on such communities. Consequently, the requirements of section 3(b) of Executive Order 13084 do not apply.

2.2.6 Regulatory Flexibility Act and the Small Business Regulatory Fairness Act of 1996

The Regulatory Flexibility Act (RFA) of 1980 (PL 96-354) requires agencies to conduct a screening analysis to determine whether a regulation will have a significant impact on a substantial number of small entities, including small businesses, governments and organizations. If a regulation will have such an impact, agencies must prepare a Regulatory Flexibility Analysis, and comply with a number of procedural requirements to solicit and consider flexible regulatory options that minimize adverse economic impacts on small entities. The RFA's analytical and procedural requirements were strengthened by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996. The RFA and SBREFA require use of definitions of "small entities", including small businesses, governments and non-profits, published by the Small Business

Administration (SBA).¹² Today's proposed rule will not have a significant economic impact on a substantial number of small entities because it will decrease the regulatory burden of the existing regulations and have a positive effect on all small entities subject to the rule. This rule improves operational flexibility for owners and operators of major stationary sources and clarifies applicable requirements for determining if a change qualifies as a major modification. We have therefore concluded that today's proposed rule will relieve regulatory burden for all small entities. We continue to be interested in the potential impacts of the proposed rule on small entities and welcome comments on issues related to such impacts.

2.2.7 Unfunded Mandates Reform Act

The Unfunded Mandates Reform Act (UMRA) of 1995 (PL 104-4) was enacted to focus attention on federal mandates that require other governments and private parties to expend resources without federal funding, to ensure that Congress considers those costs before imposing mandates, and to encourage federal financial assistance for intergovernmental mandates. The Act establishes a number of procedural requirements. The Congressional Budget Office is required to inform Congressional committees about the presence of federal mandates in legislation, and must estimate the total direct costs of mandates in a bill in any of the first five years of a mandate, if the total exceeds \$50 million for intergovernmental mandates and \$100 million for private-sector mandates.

Section 202 of UMRA directs agencies to provide a qualitative and quantitative assessment of the anticipated costs and benefits of a Federal mandate that results in annual expenditures of \$100 million or more. The assessment should include costs and benefits to State, local, and tribal governments and the private sector, and identify any disproportionate budgetary impacts. Section 205 of the Act requires agencies to identify and consider alternatives, including the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule.

We believe the proposed rule changes will actually reduce the regulatory burden associated with the major NSR program by improving the operational flexibility of owners and operators and clarifying the requirements. Because the program changes provided in the proposed rule are not expected to result in any increases in the expenditure by State, local, and tribal governments, or the private sector, we have not prepared a budgetary impact statement or specifically addressed the selection of the

12 Where appropriate, agencies can propose and justify alternative definitions of "small entity." This RIA relies on the SBA definitions.

least costly, most cost-effective, or least burdensome alternative. Because small governments will not be significantly or uniquely affected by this rule, we are not required to develop a plan with regard to small governments. Therefore, this proposed rule is not subject to the requirements of section 203 of the UMRA.

2.2.8 Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (PRA) requires Federal agencies to be responsible and publicly accountable for reducing the burden of Federal paperwork on the public. EPA has submitted an Information Collection Request (ICR) to the Office of Management and Budget (OMB) for these proposed change to the RMRR exclusion in compliance with the PRA. The ICR explains the need for additional information collection requirements and provides respondent burden estimates for additional paperwork requirements to State and local governments.

For the proposed rulemaking, EPA estimated the burden and cost of all new recordkeeping, monitoring, and reporting activities and reported them in the May 2002 ICR. These estimates of administrative burden costs are contained in the docket for this action.

Burden means the total time, effort, and financial resources expended by persons to generate, maintain, retain, and disclose or provide information to or for a federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, processing, maintaining and disclosing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An agency may not conduct or sponsor, and nor is a person required, to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR part 9 and 48 CFR Chapter 15.

3 Consideration of Alternative Approaches

Because the proposed change to the RMRR exclusion under the major NSR program has been subject to an extensive stakeholder outreach program, it has been subjected to discussions of numerous alternative approaches. These discussions included participants from the regulated community, State and local air pollution control agencies, environmental organizations, and other Federal agencies. Consequently, the proposed change to the RMRR exclusion constitutes a well reasoned compromise to the specific interests of each of those groups.

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|--|--|
| 3.1 No Regulation | The consideration of alternative approaches must include a determination of the feasibility of the Federal government taking no action. Title I of the Act mandates the NSR process. Consequently, "No Regulation" is not a viable option for this analysis. |
| 3.2 Alternative Effective Dates | The purpose of the proposed rulemaking is to increase the clarity regarding the RMRR exclusion. Consequently, the Agency plans to give this package the earliest possible effective date. Consideration of alternative effective dates would, in effect, result in additional costs and burden to sources. |
| 3.3 Economic Incentive Alternatives | While economic incentives can be considered a part of the major NSR process, the nature of the activities included within the definition of RMRR does not contain elements that are a part of the economic incentive process. |

4 Description of Affected Entities

There are two types of sources potentially affected by the proposed approaches to routine maintenance, repair, and replacement within the framework of the Agency's major NSR preconstruction permit program: electricity utility steam generating units and non-utility sources. The following discussion includes brief descriptions of each type of affected entity. The Agency made this differentiation based upon existing air quality reports and regulatory analyses: the Ozone Transport Assessment Group's (OTAG's) 1990 data base; the Operating Permits data base of respondents; and the data base developed by the RACT/BACT/LAER Clearinghouse (RBLC).

4.1 Electricity Generating Units

In 1990, approximately 2.8 trillion kilowatt hours (kWh) of electricity were generated in the United States. By 2005, EPA projects this total to increase to about 3.6 trillion kWh.¹³ More than 95 percent of the nation's generating capacity is owned by electric utilities and a significant portion of the nation's electricity generating industry is in the region affected by the final Section 126 rule.¹⁴ EPA estimates 842 electrical generating units of less than 25 MW will be operating in this region in the year 2000. In addition to electric utility power units that produce only electricity, this number includes units owned by independent power producers (IPPs) and units that co-generate electricity and steam (co-generators), whether owned by utilities or IPPs.

4.2 Non-Utility Potentially Affected Sources

There are about 14,500 sources subject to Title I operating permits requirements in the EPA's Operating Permits Database, encompassing all industry classifications in 34 states and the District of Columbia. EPA believes this database represents the majority of the universe of potentially affected sources for the major NSR program. Table 1 below is in the current NSR ICR. Table 1 displays the industry classifications most commonly affected by major NSR permitting requirements.¹⁵

13 EPA's generation requirement projections are based on an extension of the electric demand forecast of the North American Electric Reliability Council, adjusted for the impact of the Climate Change Action Plan.

14 The final Section 126 region consists of whole or parts of Delaware, District of Columbia, Indiana, Kentucky, Maryland, Michigan, North Carolina, New Jersey, New York, Ohio, Pennsylvania, Virginia, and West Virginia. The petitions filed with EPA only name parts of Indiana, Michigan, Kentucky, and New York while naming the whole of the other jurisdictions.

15 Information Collection Request for 40 CFR Part 51 and 52 Prevention of Significant Deterioration and Nonattainment New Source Review, Office of

Table 1 Most Commonly Affected Entities

Industry Group	SIC	NAICS
Pulp and Paper Mills	261	32211, 322121, 322122, 32213
Paper Mills	262	322121, 322122
Chemical Processes	281	325181, 32512, 325131, 325182, 211112, 325998, 331311, 325188
Pharmaceuticals	283	325411, 325412, 325413, 325414
Petroleum Refining	291	32411
Automobile Manufacturing	371	336111, 336112, 336712, 336211, 336992, 336322, 336312, 33633, 33634, 33635, 336399, 336212, 336213
Electric Services	491	221111, 221112, 221113, 221119, 221121, 221122
Natural Gas Transport	492	48621, 22121

Management and Budget (OMB) Control Number 2060-0003; EPA Form
Number 1230.09.

5 Assessing Benefits and Costs

The Agency believes all sources potentially subject to major NSR permitting will use the RMRR approach promulgated by EPA. To analyze the benefits and costs associated with the change, EPA looked at both the beneficial effects on industry maintenance practices by having identified categories of activities as RMRR and on the potential reduction in work for industry and reviewing authorities through having to perform less applicability determinations. As noted above, there is difficulty in developing quantitative estimates of the effect of changes to the RMRR exclusion on emissions and costs. However, EPA has powerful modeling tools, like the Integrated Planning Model (IPM), that enables them to make educated assessments of the resulting impact of such regulatory revisions.

We have attempted to analyze quantitatively the possible emissions and cost consequences of the range of different approaches to the RMRR exclusion described above. The analysis was conducted using the IPM. This analysis was done for electric utilities because we have a powerful model to perform such an analysis that we do not have for other industries. We think the results for the electric utilities accurately reflect the trends we would see in other industries.

The DOE also attempted to analyze quantitatively the possible emissions consequences of the range of different approaches to the RMRR exclusion described above. The NEMS model is similar to the IPM and has been widely used. DOE provided its analysis to EPA and a copy of the analysis is included in Appendix A. Using the NEMS, DOE evaluated a variety of changes in energy efficiency and availability, as well as the effect on emissions resulting from these changes.

We have also attempted to estimate the significant reduction in the costs to industry and reviewing agencies, due to decreases in making applicability determinations, associated with identifying categories of activities that are RMRR.

5.1 Analysis

In order to evaluate the impact of the routine maintenance provisions, EPA considered a scenario under which major NSR regulations remained in place and a range of scenarios that could occur if existing plants were able to undertake routine maintenance activities without being subject to major NSR. The first scenario is intended to represent the existing program, which the EPA has found impedes or results in cancellation of projects that maintain and improve reliability, availability, and efficiency at existing

power plants.¹⁶ The second range of scenarios is based on companies receiving flexibility under the major NSR program that removes many of these impediments. As part of this analysis, EPA reviewed three key variables: change in SO₂ emissions, change in NO_x emissions and change in cost.

When we issue a final rule to establish categories of activities that qualify as RMRR under major NSR, we expect that final rules governing the use of plantwide applicability limits (PALs), and Clean Units will already be in place. Some sources within the electric utility generation industry may take advantage of these changes. However, any such decision will be based on case specific information related to their past operating levels, current levels of control and the company's specific strategies for complying with major NSR. Therefore, we can not make estimates on how many sources may take advantage of PALs and Clean Units. To the extent they are used within the industry, they will dampen the effects shown in this analysis (i.e., estimated decreases and increases will not be as large).

One part of our analysis was performed using IPM. A copy of this analysis is included in Appendix B. IPM is a linear programming model that EPA uses to analyze the effect of various environmental policies on the power sector. It provides forecasts of least-cost capacity expansion, electricity dispatch and emission control strategies for meeting energy demand and environmental, transmission, dispatch and reliability constraints. EPA has used it to analyze many environmental policies including the Phase II Acid Rain Nitrogen Oxide regulations and the Nitrogen Oxide SIP Call. Analysis can be performed varying multiple constraints such as availability of various types of power plants (e.g. coal-fired, nuclear, gas-fired combined cycle units), heat rates of various types of power plants, environmental constraints (e.g. caps on emissions, emission rate limitations). More detail regarding IPM can be found in the document titled "Documentation of EPA Modeling Application (V.2.1) Using the Integrated Planning Model, which can be found at: <http://www.epa.gov/airmarkets/epa-ipm/index.html>.

The first scenario, referred to as the major NSR base cases approximates utility behavior under the current program, where the EPA has found that companies perform limited maintenance on coal plants because of concerns about major NSR. In this scenario, it was assumed that the performance of coal units would deteriorate, resulting in higher heat rates and lower capacities. EPA did not assume that reduced maintenance resulted in a change in maximum potential unit availability. This is because over the last

16 This finding is described in detail in EPA's June 13, 2002 New Source Review Report to the President.

20 years, availability of coal-fired plants has increased even as the plants have aged. This is due in large part to improved maintenance practices. For instance tests to inspect boiler tubes have been continually improving (see “Preventing Boiler Tube Failures with EMAT’s”, S.P. Clark et al, “EPRI International Conference on Boiler Tube Failures and HRSG Tube Failures and Inspects”, November 6-8, 2001). These improved preventive maintenance practices allow companies to replace components during regularly scheduled outages before they fail rather than causing unscheduled outages after they fail. The second range of scenarios, referred to as increased maintenance cases #1 - #5 , looks at a range of scenarios for what might happen in the utility sector if companies were provided with increased flexibility under major NSR to perform maintenance. This would result in lower heat rates, higher capacities and/or higher unit availabilities for these units. Finally, EPA also looked at one case (standard base case) in which heat rate, capacity and unit availability did not change.

It is important to note that there are several limitations to this analysis. The limitations are discussed in detail in Appendix B.

Results:

Changes in SO₂ Emissions, NO_x emissions and cost are summarized in tables 2, 3 and 4 of Appendix B. EPA’s analysis suggests there is very little change in SO₂ emissions over the entire time period studied under the two scenarios. DOE’s NEMS analysis showed a similar pattern – i.e., very little change in SO₂ emissions relative to estimates for the Base Case. This is because SO₂ emissions are already capped nationally under the Title IV Acid Rain Provisions.

However, because emissions can also be shifted temporally by banking emission allowances to be used in a future year there can be significant changes in emissions for a specific year. While temporal distribution of emissions did not change much over time in the major NSR cases considered, there was more temporal distribution of emissions in the increased maintenance scenarios considered.

For NO_x which is not capped, there can be changes in emissions. The modeling scenarios evaluated by EPA and DOE suggest a range in the potential effect on NO_x emissions. It appears that the assumptions on the effect on plant availability of increasing the flexibility under major NSR to perform maintenance and replacement projects is a key factor affecting changes in NO_x emissions relative to the base case.

This analysis suggests that the effect of changing the requirements of major NSR with regards to routine maintenance will have on emissions is dependent upon the effect that it will have on maximum unit availabilities. If the routine maintenance changes increase efficiency and plant capacity without increasing maximum unit availability, this analysis suggests that the changes could decrease emissions. The amount of that emission decrease would depend both on how much heat rate decreased and capacity increased and how quickly these changes occurred. The greater the heat rate decrease and capacity increase and the more quickly the changes occurred, the greater the emission reductions. The DOE analysis suggests similar results. Efficiency improvements resulting from increased maintenance decrease NO_x emissions, whereas availability improvements increase emissions. In the cases represented in this analysis, the impacts of the assumed reductions in heat rates tend to dominate the corresponding effects of the assumed availability increases. A copy of this analysis is included in Appendix A of this report. A more complete description of the analysis and its results can be found in EPA Air docket A-2002-04.

If on the other hand, the new provisions increase maximum unit availabilities, this analysis suggests that the changes could increase emissions.

Changes in cost are summarized in table 4 of Appendix B. Note that this analysis does not consider changes in maintenance costs, it only assumes changes in fuel costs and changes in capital costs associated with new generating units and new emission control equipment. Therefore it probably understates the cost of the increased maintenance scenarios and understates the cost of the Major NSR Base-case.

5.2 Benefits

“Benefits” refers to any and all outcomes of a regulation that contribute to an enhanced level of social welfare. The two primary types of benefits that can be attributed to the proposed change to the RMRR exclusion are *temporal* health-related benefits and benefits from *avoided costs*.

The Agency believes most of the benefits from the proposed change to the RMRR exclusion will be derived from cost savings, of which this report identifies four types: 1) increased efficiency for industrial production, 2) improved flexibility and reaction time, 3) reductions in the number of applicability determinations performed by industry and reviewing authorities and their associated delays and 4) reductions in the need for the construction of new sources. The delays associated with applicability determinations can limit industry’s ability to react quickly in a changing economic environment. For many source categories, this is not a big problem because they undertake major NSR-related activities on an infrequent basis. However, for a number of industries, the Agency has

identified as many as three or four changes take place each year that could prompt an Operating Permit revision and, potentially, a major NSR permit, as well.¹⁷ When such changes occur, permitting lags can significantly impact the profitability of the source by preventing timely changes in processes that improve competitiveness and protect market share. For EGUs and other boiler applications, the failure to perform timely repairs and maintenance can reduce boiler efficiency and thereby reduce electricity generating capacity. Even a one percent change in the heat rate of a boiler (*ceteris paribus*) can impose a half a million dollar change in net revenues for a 500 MWe coal-fired boiler.¹⁸ Allowing sources to respond to maintenance-related problems in a revenue maximizing fashion will unambiguously increase revenues (and profits) and reduce operating costs for industry.

The net effect of these cost savings could be substantial. In tangible cost savings, the ability to address larger routine maintenance and repair problems quickly can conceivably result in tens of millions of dollars in savings through more efficient electricity generation alone. The IPM analysis showed that increased levels of maintenance can lead to increased availability of units which will decrease the need for new generating units saving tens of millions of dollars. That, combined with the potential for improved national and international competitiveness and market share due to RMRR flexibility improvements could potentially result in job savings, job creation, and other macro-economic improvements. Unfortunately, there is no way to develop an estimate for these improvements.

Finally, the analyses also show that there may be reduced NOx emissions under some of the increased maintenance scenarios due to improved efficiency of the units.

This proposal invites public comments on this analysis and on future refinements of this analysis.

5.3 Costs

The IPM analysis showed significant decreased costs associated with the increased maintenance scenarios. These decreases result from the increased availability of existing units and, therefore, the decrease in construction of new generating units in order to meet electricity demand. The analysis did not consider changes in maintenance costs.

17 U.S. EPA, 1994, "Economic Analysis, Regulatory Flexibility Act Screening Analysis, and Paperwork Reduction Act Information Collection Request Analysis for Proposed Revisions to Part 70 Operating Permits Regulations," by Daniel Charles Mussatti, pp 33-48.

18 <http://ildpower.com/fossil02.html>

5.3.1 Source Costs

EPA believes costs will be insignificant for most of the sources participating in the RMRR program under either approach. For instance, the first annual task at each participating facility will be to estimate the replacement costs of all of its process units. Since these data are readily available to the applicant through financial records (such as insurance forms) it should take no more than 4 hours per process unit (source) for each facility to inventory all of its units. Following the estimation of replacement cost for each process unit, the facility must create an annual report for each source, detailing all of the RMRR-related costs and activities at that unit. For most units, this will be a relatively short report, again probably no more than 4 hours per report to gather and record each unit's RMRR-related activities into the facility's annual report.

As stated in the preamble to the proposed change to the RMRR exclusion, sources must report activities aggregated by costs across all appropriate process units, rather than aggregating the cost of activities across pollutants. While this limitation necessarily increases the burden and cost to industry, EPA believes the cost of that additional burden is minimal. Table 2 displays the expected long-term annual burden and cost of this rulemaking to sources for the maximum scope of this proposed rulemaking.

Table 2 Expected Annual Marginal Burden and Cost to Process Units (Sources) for the Annual Maintenance, Repair, and Replacement Allowance Approach

Entity / Activity	Respondents	Hours Per Respondent per Year	Total Annual Hours (All Respondents)	Annual Cost per Respondent ¹	Total Annual Cost (All Respondents) ¹
Sources					
Rule Assimilation, Development of Strategy ²	1,450	4	5,800	\$300	\$435,000
Assessment of Replacement Value	1,450	4	5,800	\$300	\$435,000
Preparation of Annual RMRR Report	1,450	4	5,800	\$300	\$435,000
Total Source Burden and Cost	1,450	12	17,400	\$900	\$1,305,000

¹ All costs are in 2002 dollars

² One-time items have been averaged over the three year life of this ICR.

There are approximately 14,500 sources of air pollution potentially subject to major NSR permitting. ¹⁹ Each of these sources will have to undertake the tasks listed in Table 2, resulting in an increased burden to all potentially affected sources of about \$900 per year (\$1.3 million annually for all sources) under the annual maintenance, repair, and replacement allowance approach. Because there are so many sources that are potentially affected

19 Most sources contain more than one pollution creating unit, but this report does not need to differentiate by pollutant for the purposes of this analysis.

and will need to perform the minimal annual tasks of inventory and reporting, the increase in burden dominates the expected effects of the RMRR program. However, through the potential for reduced uncertainty and improved flexibility associated with the proposed changes to RMRR, the Agency believes that although not measurable, for those sources subject to major NSR, the overall benefit to sources able to avoid major NSR permitting through the RMRR program outweighs the relatively small increase in burden and costs imposed upon the entire universe of potentially affected sources.

Table 3 Expected Annual Marginal Burden and Cost to Process Units (Sources) for the Equipment Replacement Approach

Entity / Activity	Respondents	Hours Per Respondent per Year	Total Annual Hours (All Respondents)	Annual Cost per Respondent ¹	Total Annual Cost (All Respondent) ¹
Sources					
Rule Assimilation, Development of Strategy ²	1,450	4	5,800	\$300	\$435,000
Assessment of Replacement Value	1,450	4	5,800	\$300	\$435,000
Total Source Burden and Cost	1,450	8	11,600	\$600	\$870,000

1 All costs are in 2002 dollars

2 One-time items have been averaged over the three year life of this ICR.

The 14,500 sources of air pollution potentially subject to major NSR permitting under the proposed equipment replacement approach will have to undertake the tasks listed in Table 3, above. There is no reason to believe the number of affected sources or the burden differs between the two proposed approaches. The primary difference between the two proposed approaches is that the equipment replacement approach does not have an associated annual reporting requirement. Consequently, the number of affected sources and the burden associated with each of the tasks in Table 3 has the same value as its analog in Table 2 for the annual maintenance, repair, and replacement allowance approach. Each affected source will expend about 8 additional hours in regulatory-related activities, relative to the *status quo*, for a total additional cost of about \$870 thousand per year. As with the annual maintenance, repair, and replacement allowance approach, the Agency believes that the reduction in uncertainty and improved flexibility associated with the proposed equipment replacement RMRR approach outweighs the small increase in burden and costs imposed on the entire universe of potentially affected sources.

5.3.2 Reviewing Authority Costs

Reviewing authorities seeking to implement the new RMRR provisions will also incur costs. Reviewing authorities, however, do not have to adopt any particular provision as long as they can show that their version of the program is at least as stringent as the EPA program. Reviewing authorities

who do not want to implement the new provisions will incur costs associated with demonstrating the adequacy of their existing programs. Each participating reviewing authority will have to learn the rule and incorporate it into its SIP. The Agency identified five tasks that each reviewing authority must perform for the incorporation of the RMRR program into its SIP and two annual tasks it will have to perform to maintain the RMRR program. Table 4 displays the expected annual burden and cost of this rulemaking to reviewing authorities for the maximum scope of this analysis. Each reviewing authority can expect to incur an additional 1,400 hours of activity per year.

Table 4 Expected Marginal Burden and Cost to Reviewing Authorities

Entity / Activity	Respondents	Hours Per Activity	Total Annual Hours (All Respondents)	Annual Cost per Respondent ¹	Total Annual Cost (All Respondent) ¹
Rule Familiarization ²	112	20	2,240	\$740	\$82,880
Applicability Determinations ²	112	10	1,120	\$370	\$41,440
SIP Revision ²	112	40	4,480	\$1,480	\$165,760
Public Hearing and SIP Modification ²	112	30	3,360	\$1,110	\$124,320
Legislative Coordination ²	112	40	4,480	\$1,480	\$165,760
Annual Report Review ³	112	8	116,480	\$38,480	\$4,309,760
Major NSR Determination ^{3,4}	112	10	7,280	\$2,405	\$269,360
Total One-Time RA Burden and Cost ¹	112		15,680	\$5,180	\$580,160
Total Annual Burden and Cost ¹	112		123,760		\$4,579,120

1 All costs are in 2002 dollars

2 One-time items have been averaged over the three year life of this ICR.

3 Annual items have been estimated at 130 sources per RA per year.

4 Assumes 1 determination for every 20 sources.

5.3.3 Federal Costs

The Federal government incurs a moderate long-run burden from the promulgation of this rule, but the Agency believes the burden and cost of the RMRR program to be justified. Furthermore, the Agency believes the slight increase in burden will be somewhat offset by the reduction in oversight and enforcement activities that will result from fewer major source modifications occurring each year. For the RMRR program, EPA will be responsible for two one-time activities, SIP revision support (at least 10 hours of guidance per year, or 3,360 hours over the three years of expected SIP revision), and SIP review and approval (about one day per SIP, or a total of 299 hours per year). Annually, the EPA will have two tasks to perform: management of the RMRR program to those sources where it has authority (about 10 hours per year, or 1,450 hours per year per Federally managed source), and oversight of RA report review and

major NSR determinations, which will take about half as long for the Federal government to review each form, relative to the RA's burden for each task. The Agency typically provides Reviewing Authority oversight to one source determination in ten. Table 5, below, displays the average annual expected burden and cost to the Federal government for the RMRR program.

5.3.4 Bottom Line Impacts

The proposed annual maintenance, repair, and replacement allowance approach to RMRR activities will add about \$13 million annually to the cost of the major NSR program. However, the effect of small costs accrued by large numbers of sources makes this total misleading. About 61 percent of that cost applies to the annual cost of the RMRR program to sources - most of which is attributable to the relatively small cost of additional reporting that is spread across 14,500 sources (at an annual cost of less than a thousand dollars per source). If this reporting cost is removed from total, the annual cost of the annual maintenance, repair, and replacement allowance RMRR program is less than \$200,000. The equipment replacement approach costs somewhat less than the annual maintenance, repair, and replacement allowance approach, since it does not have an annual reporting requirement. Consequently, the equipment replacement approach will cost sources \$870 thousand per year, or about \$600 per source per year.

Table 5 Expected Yearly Marginal Burden and Cost to The Federal Government

Entity / Activity	Number of Respondents Served	Hours per Year Per Respondent	Total Annual Hours	Average Annual Cost per Respondent	Total Annual Cost (All Respondent) ¹
Coordination with RAs ²	112	10	1,120	\$41,440	\$41,440
Review of SIPS ²	112	8	896	\$11,063	\$11,063
Management of Federal Program ³	145	10	1,450	\$370	\$53,650
Annual Report Review ³	13,050	4	5,220	\$4	\$193,140
Major NSR Determination ^{3,4}	13,050	10	13,050	\$6	\$482,850
TOTAL One-Time Federal Burden and Costs ¹		13	1,456	\$52,503	\$52,503
TOTAL Annual Federal Burden and Costs ¹					\$502,190

1 All costs are in 2002 dollars

2 One-time items have been averaged over the three year life of this ICR.

3 Annual items have been estimated at 130 sources per RA per year.

4 Assumes 1 determination for every 20 sources.

Under both approaches, the Agency has provided opportunities for industry to improve its responsiveness to changing economic conditions while performing critical routine repair, replacement and maintenance activities. These improvements derive from the RMRR program's primary goals - the reduction of uncertainty and regulatory delay related to the

performance of such activities. While the Agency believes these benefits may be significant, the effect of a decrease in uncertainty and regulatory delay is not quantifiable in the traditional sense. Instead, the Agency's assertion that the two alternative approaches to RMRR provide regulatory relief depends on a simple concept, the Le Chetelier Principle in its economic application: reducing the restrictions on industry reduces costs. Consequently, while the measurable portion of the proposed approaches indicate increases in burden and cost, the program *in toto* should be beneficial.

This proposal invites public comments on these judgments and on additional refinements that can be made to this analysis.

Table 6 Bottom Line One-Time and Annual Burden and Costs¹

Entity / Activity	Number of Respondents	Hours per Year per Respondent	Total Annual Hours (All Respondents)	Annual Cost per Respondent ¹	Total Annual Cost (All Respondents) ¹
Process Units (Sources) Annual Maintenance, Repair, and Replacement Allowance Approach	1,450	12	17,400	\$900	\$1,305,000
Process Units (Sources) Equipment Replacement Approach	1,450	8	11,600	\$600	\$870,000
Reviewing Authorities (Both Approaches)	112	140	15,680	\$5,180	\$580,160
US Environmental Protection Agency (Both Approaches)	1	23	2,906	\$851	\$107,522
Total Expected Cost (Annual Maintenance, Repair, and Replacement Allowance Approach)					\$1,992,682
Total Expected Cost (Equipment Replacement Approach)					\$1,557,682

¹ All costs are in 2002 dollars

5.3.5 Caveats

The analysis is based upon the best data available to the Agency at this time. However, inconsistencies in RA reporting techniques, incomplete data sets, and sampling limitations imposed upon the Agency by the Paperwork Reduction Act necessitated a certain amount of extrapolation and "best-guess" estimations by Reviewing Authorities and Agency experts. Consequently, the reader should not consider the conclusions to be an exact representation of the level of burden or cost that will occur. Instead, this report should be considered a directionally correct assessment of the impact the programmatic changes included in this rulemaking.

Furthermore, because the final version of this rulemaking has not been determined, the EPA cannot make a fair estimate *ex ante* of the impact on number of permits that will be affected by this rulemaking. However, in the context of what has been done for over ten years for major NSR, the Agency can be relatively confident that the DIRECTION and the MAGNITUDE of the expected changes due to the new RMRR program reported in this analysis are representative of what will be observed *ex post*.

For most analyses, the Agency relies upon a Bayesian approach to predicting the future impacts of its regulations: it relies upon past information of a similar nature as the best predictor of the future. However, the determination of the number of potentially affected sources in this analysis involves the assessment of counterfactual data. In other words, the Agency had to predict how many sources would *not* perform specific actions or, for whatever reason, were not reporting on specific actions undertaken. Clearly, no data source can supply such information. Therefore, the estimates in this analysis are based to a much greater extent upon the experiences and expertise of the Agency's staff and consultants, as well as industry representatives.

APPENDIX A

EMISSIONS IMPACTS OF HIGHER EFFICIENCIES AND AVAILABILITIES FOR COAL-FIRED GENERATING UNITS AND EMISSION PROJECTIONS UNDER NSR ALTERNATIVES (DEPARTMENT OF ENERGY)

EMISSIONS IMPACTS OF HIGHER EFFICIENCIES AND AVAILABILITIES FOR COAL-FIRED GENERATING UNITS

Description: Utilizing assumptions provided by the Office of Fossil Energy of the Department of Energy, this analysis considers the effects of potential improvements in coal power plant heat rates and availabilities. The Office of Fossil Energy believes that these improvements might occur if they could be accomplished without triggering the major New Source Review (major NSR) requirements. Specifically, heat rates for coal-fired plants are assumed to decrease by 5, 10, and 15 percent by 2010. Each of these cases are also combined with assumed increases in availability for coal capacity of 2 and 5 percentage points by 2010. The resulting impacts on fuel use and emissions (sulfur dioxide, nitrogen oxide, mercury, and carbon dioxide) are examined.

Methodology: Using the National Energy Modeling System (NEMS), the assumed changes in heat rates and availabilities are analyzed by modifying the AEO2002 Reference Case. The improvements are phased in through 2010. Although the potential to improve heat rates and availabilities could vary among coal units, this analysis assumes that the same rate of change occurs to all of this capacity. Although these improvements could require increases in maintenance costs, no change in these costs is incorporated. Potential improvements to oil- and gas-fired capacity are also not included.

Analysis: Improvements in heat rates (i.e., increased operating efficiency) result in lower coal consumption and emissions, although sulfur dioxide emissions nationally are unaffected since there is a cap on total emissions. Compared to the AEO2002 Reference Case, a 5-percent decrease in heat rates reduces carbon and nitrogen oxide emissions by about 4 percent each and mercury emissions by 2 percent in 2010 (Table 1). In 2020, the respective emissions reductions are 3 percent, 4 percent, and 2 percent. Not surprisingly, higher assumed efficiency improvements result in greater emissions reductions. A 10-percent decrease in heat rates reduces carbon and nitrogen oxide emissions by about 8 percent each and mercury emissions by 5 percent in 2010 (Table 2). In 2020, the respective emissions reductions are 7 percent, 8 percent, and 4 percent. A 15-percent decrease in heat rates reduces carbon, nitrogen oxide, and mercury emissions in 2010 by about 12 percent, 13 percent, and 9 percent, respectively (Table 3). In 2020, the corresponding reductions are 10 percent, 12 percent, and 8 percent.

Increasing the availability of coal-fired capacity leads to increases in coal generation, consumption and emissions. However, these increases in emissions are not enough to offset the reductions that result from the efficiency improvements, except when the lowest assumed efficiency improvement (5 percent) is combined with the highest assumed availability

increase (5 percentage points). Compared to the Reference Case, mercury emissions in this case are about 1 percent higher in 2010 and 2020 (Table 1). Carbon emissions are 2 percent lower in 2010 and 1 percent lower in 2020. Nitrogen oxide emissions are slightly lower in 2010 but slightly higher in 2020. If a 5-percent decrease in heat rates is combined with the lesser availability increase of 2-percentage points, carbon and nitrogen oxide emissions in 2010 are each 3 percent lower than in the Reference case and mercury emissions are 1 percent lower. In 2020, the reductions are about 2 percent each for carbon and nitrogen oxide and 1 percent for mercury.

Compared to the AEO2002 Reference Case, both the 10-percent and 15-percent efficiency improvement cases are projected to lower emissions when combined with both of the assumed availability increases. Assuming a 10-percent decrease in heat rates and a 2-percentage point increase in availability lowers carbon and nitrogen oxide emissions in 2010 by 7 percent each and mercury emissions by 5 percent (Table 2). A 5-percentage point increase in availability results in further increases in coal use, so the emissions reductions resulting from the 10-percent heat rate improvements are further offset by the availability increases. In this case, carbon, nitrogen oxide, and mercury emissions in 2010 are 6 percent, 5 percent, and 2 percent lower than in the AEO2002 Reference Case, respectively. A 15-percent decrease in heat rates combined with a 2-percentage point increase in availability lowers carbon and nitrogen oxide emissions in 2010 by 11 percent each and mercury emissions by 8 percent (Table 3). A 15-percent decrease in heat rates combined with a 5-percentage point increase in availability lowers carbon emissions by 10 percent, nitrogen oxide emissions by 9 percent, and mercury emissions by 6 percent in 2010. In 2020, the emissions reductions in the combined heat rate/availability improvement cases are typically about 1 to 2 percentage points lower than the corresponding results in 2010.

In conclusion, efficiency improvements resulting from increased maintenance are expected to decrease emissions, whereas availability improvements are expected to increase emissions. In the cases represented in this study, the impacts of the assumed reductions in heat rates tend to dominate the corresponding effects of the assumed availability increases. However, some of the assumed heat rate improvements could be difficult to achieve. In 2000, the average heat rate for coal capacity was about 10,250 btu per kilowatt-hour, so a 10-percent reduction by 2010 would lower the average heat rate to about 9,200 btu per kilowatt-hour. This heat rate would be almost as good as the heat rate assumed for new coal units. A 15-percent decrease would reduce the heat rate to a level below the heat rate for new units. Even if the assumed heat rate improvements are feasible, they may not be economic. The required

increase in maintenance costs, which is not represented in these cases, may be higher than the resulting savings in fuel costs.

Since the assumed efficiency improvements result in lower fuel consumption, it may also be possible to increase output at coal-fired units without resulting in a net increase in coal consumption and triggering major NSR. The assumed increases in availability represent one option for increasing generation. Another way to increase generation would be to increase capacity, but this option is not considered in this analysis.

Emission Projections Under NSR Alternatives

General Concepts

This paper addresses the emission implications of New Source Review (NSR) policies. These policies will be discussed in the context of their impacts on fossil fuel fired power plants, although the regulations also apply to other source categories as well. The units of key concern are existing coal-fired generators which replace a part or component and which, in doing so, could increase emissions. The issue is how different policies on defining routine maintenance, repair, and replacement (RMR&R) might influence national emission rates. The policies in question could create either incentives or barriers to improved efficiency, reliability or capacity when actions are taken during maintenance, repair, or replacement of parts at a facility subject to air pollution regulation.

Generally speaking, when parts at a power plant are replaced, they are replaced with parts having the equivalent function. In many cases, in the time period between the original operation of the power plant, and the point where a part is replaced, technology has advanced and better performing parts are now available. Indeed, in some cases, exact replacements for the original design are not available. The main mechanism for emissions to be affected is through improvement in unit efficiency, capacity, and reliability, as newer parts tend to be more efficient and less prone to malfunction. On a regional basis, the primary impact of higher efficiency is to lower emissions, because less fuel is needed to create the same amount of electricity. Changes causing an increase in capacity, on the other hand, could lead to greater emissions, because the alternative to increased output from existing coal power plants would probably be increased construction of new units, which would have lower emissions per kilowatt-hour generated (whether coal or gas-fired). Improved reliability or availability has an effect similar to increased capacity if existing plant generation displaces new plant generation, as demand for power grows. However, if a change in capacity or availability occurred more often, or to a greater degree, at lower emitting coal units than at higher emitting coal

units, then economic dispatching of the inventory of plants could lead to lower emissions overall. Given the complexity of the problem, it is difficult to predict the outcome of changes in efficiency, capacity and reliability without the assistance of complex computer models.

These general trends in emissions are not universal. Pollutants which are "capped", like sulfur dioxide (SO₂) under the acid rain program, are not influenced by these factors. Any reduction or increase in emissions at a particular unit would be adjusted for within the emission cap, and regional emissions would remain constant. Nitrogen oxides (NO_x) present a complex situation, because emissions in most Eastern states are capped under the ozone/NO_x SIP Call, whereas emissions in other states are not capped. Mercury emissions from existing power plants are currently not regulated, but in the future may be subject to a capped limit under a regulatory scheme like the Clear Skies Initiative, or they may be uncapped under a Section 112 regulatory scheme.

Emission Projections

The DOE/EIA NEMS model was used to evaluate the emissions implications of current and alternative NSR approaches. Tables 1 through 3, below, present modeling results for a range of assumptions for efficiency and availability changes which might result for an NSR approach which facilitated improvements, versus one which posed barriers to such improvements. In each table, the current rules are represented by the "Base Case" and possible outcomes for modified NSR rules are included as alternative scenarios. In this analysis, "capacity" changes are defined as changes which increase the amount of fuel which could be utilized above initial design rates for the power plant. No increase in hourly fuel use was assumed, due to expectations that physical changes at a unit which caused increases in such capacity would be precluded by environmental regulation. Results are included for carbon dioxide emissions (expressed as carbon), SO₂, NO_x, and mercury.

Figures 1 through 3 show NO_x emission changes over time for the same hypothetical changes in unit availability and heat rate (efficiency). These results reflect extreme scenarios, and actual outcomes are likely to fall short of the potential emission reductions and increases presented (perhaps by about one-half). Mitigating factors include the ability of source owner/operators to avoid new source review by "netting out", the likelihood that modest improvements in these parameters could be made at existing units without triggering NSR, and the possibility that potential improvement rates would not be achieved in practice. Attachments 1 and 2 present greater detail on the technologies assumed and the mechanisms by which changes in efficiency and availability would manifest in annual emissions.

Table 1.

Parameter		Scenario			
		Base Case	10/0 *	10/2 **	10/5 ***
2010					
Coal Generation (billion kilowatthours)	2215.2	2231.7	2271.9	2336.6	
Coal Consumption (quadrillion Btu)	22.8	20.7	21.0	21.6	
Avg. Efficiency - Coal (percent)	33.2%	36.9%	36.8%	36.9%	
Carbon Emissions (million metric tons)	688.8	634.4	639.5	647.6	
Sulfur Dioxide Emissions (million tons)	9.7	9.7	9.7	9.7	
Nitrogen Oxide Emissions (million tons)	4.0	3.7	3.8	3.8	
Mercury Emissions (tons)	43.7	41.5	41.7	42.8	
2020					
Coal Generation (billion kilowatthours)	2423.2	2464.3	2512.1	2600.5	
Coal Consumption (quadrillion Btu)	24.7	22.7	23.2	24.0	
Avg. Efficiency - Coal (percent)	33.5%	37.0%	37.0%	36.9%	
Carbon Emissions (million metric tons)	790.2	737.8	745.7	759.4	
Sulfur Dioxide Emissions (million tons)	8.9	8.9	8.9	8.9	
Nitrogen Oxide Emissions (million tons)	4.2	3.9	3.9	4.0	
Mercury Emissions (tons)	44.0	42.2	42.7	43.2	

* Scenario 10/0 assumes 10% improvement in heat rate and no change in availability.

** Scenario 10/2 assumes 10% improvement in heat rate and 2% in availability.

*** Scenario 10/5 assumes 10% improvement in heat rate and 5% in availability.

Table 2.

Parameter		Scenario		
	Base Case	15/0 *	15/2 **	15/5 ***
2010				
Coal Generation (billion kilowatthours)	2215.2	2235.0	2280.3	2343.8
Coal Consumption (quadrillion Btu)	22.8	19.6	20.0	20.5
Avg. Efficiency - Coal (percent)	33.2%	39.0%	39.0%	39.0%
Carbon Emissions (million metric tons)	688.8	606.9	612.3	619.6
Sulfur Dioxide Emissions (million tons)	9.7	9.7	9.7	9.7
Nitrogen Oxide Emissions (million tons)	4.0	3.5	3.6	3.7
Mercury Emissions (tons)	43.7	39.8	40.3	41.0
2020				
Coal Generation (billion kilowatthours)	2423.2	2489.0	2525.8	2616.1
Coal Consumption (quadrillion Btu)	24.7	21.8	22.1	22.9
Avg. Efficiency - Coal (percent)	33.5%	39.0%	38.9%	38.9%
Carbon Emissions (million metric tons)	790.2	712.6	717.7	730.5
Sulfur Dioxide Emissions (million tons)	8.9	8.9	8.9	8.9
Nitrogen Oxide Emissions (million tons)	4.2	3.7	3.8	3.9
Mercury Emissions (tons)	44.0	40.5	41.0	42.2

* Scenario 15/0 assumes 15% improvement in heat rate and no change in availability.

** Scenario 15/2 assumes 15% improvement in heat rate and 2% in availability.

*** Scenario 15/5 assumes 15% improvement in heat rate and 5% in availability.

Table 3.

Parameter	Scenario			
	Base Case	5/0 *	5/2 **	5/5 ***
2010				
Coal Generation (billion kilowatthours)	2215.2	2222.8	2264.1	2328.8
Coal Consumption (quadrillion Btu)	22.8	21.7	22.1	22.7
Avg. Efficiency - Coal (percent)	33.2%	34.9%	35.0%	34.9%
Carbon Emissions (million metric tons)	688.8	660.7	666.5	676.7
Sulfur Dioxide Emissions (million tons)	9.7	9.7	9.7	9.7
Nitrogen Oxide Emissions (million tons)	4.0	3.9	3.9	4.0
Mercury Emissions (tons)	43.7	42.9	43.4	44.0
2020				
Coal Generation (billion kilowatthours)	2423.2	2457.4	2489.2	2570.3
Coal Consumption (quadrillion Btu)	24.7	23.8	24.1	24.9
Avg. Efficiency - Coal (percent)	33.5%	35.2%	35.2%	35.2%
Carbon Emissions (million metric tons)	790.2	765.3	771.0	783.9
Sulfur Dioxide Emissions (million tons)	8.9	9.0	9.0	8.9
Nitrogen Oxide Emissions (million tons)	4.2	4.0	4.1	4.2
Mercury Emissions (tons)	44.0	43.3	43.7	44.6

* Scenario 5/0 assumes 5% improvement in heat rate and no change in availability.

** Scenario 5/2 assumes 5% improvement in heat rate and 2% in availability.

*** Scenario 5/5 assumes 5% improvement in heat rate and 5% in availability.

Conclusions

For capped pollutants, like SO₂, NSR policy will have no impact on future emissions. For uncapped, or partially capped pollutants, a policy that facilitates improvements in efficiency and reliability as parts are replaced will tend to reduce national emissions. For the pollutants and scenarios examined in this analysis, emissions declined by a moderate amount (typically 3-7%) in all scenarios except one, compared to a baseline case in which such improvements in plants were prohibited under NSR policy. The one scenario in which some emissions increased (by up to 1%) combined a very high increase in availability with a low improvement in efficiency. This scenario is not considered a likely outcome from NSR regulatory changes (see discussion of likely availability changes in Attachment 1), but is included for completeness.

Figure 2

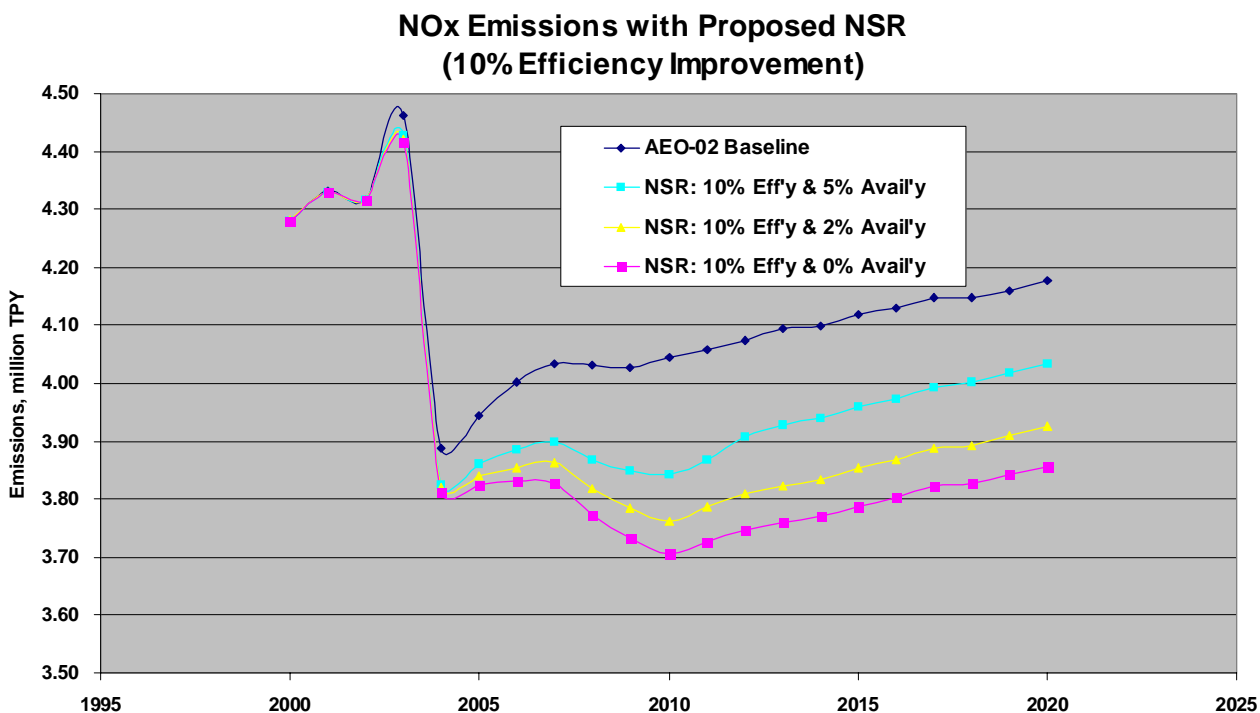


Figure 3

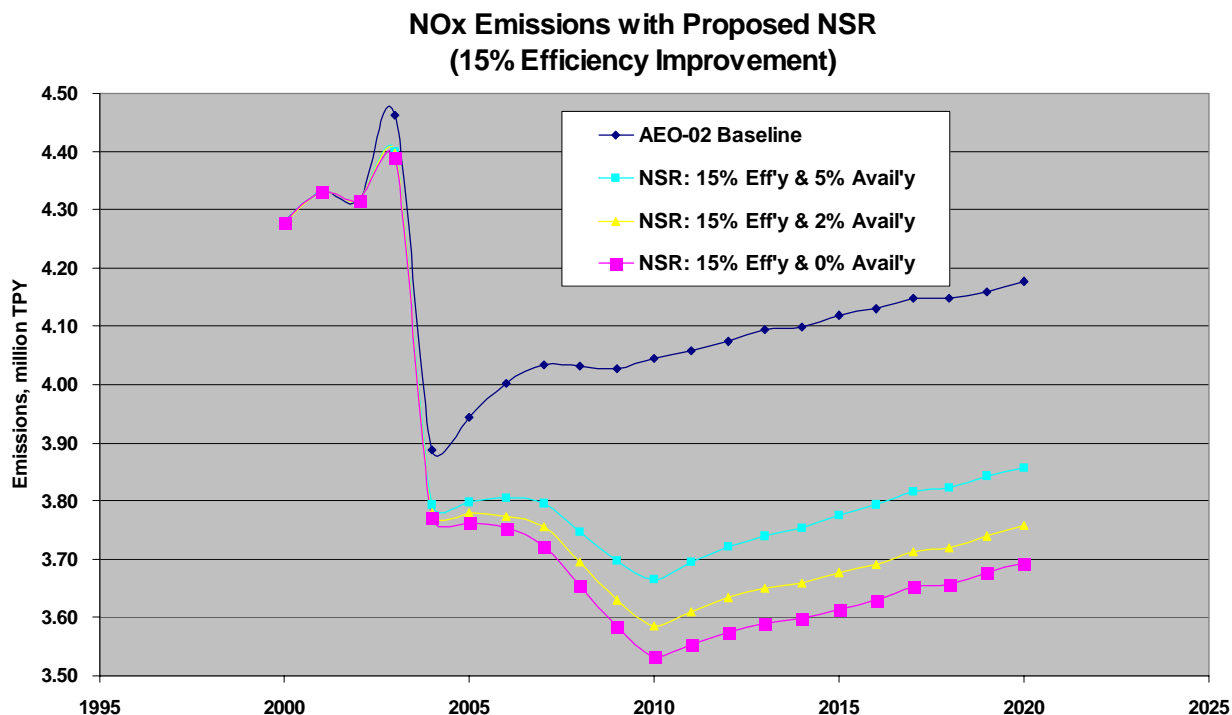
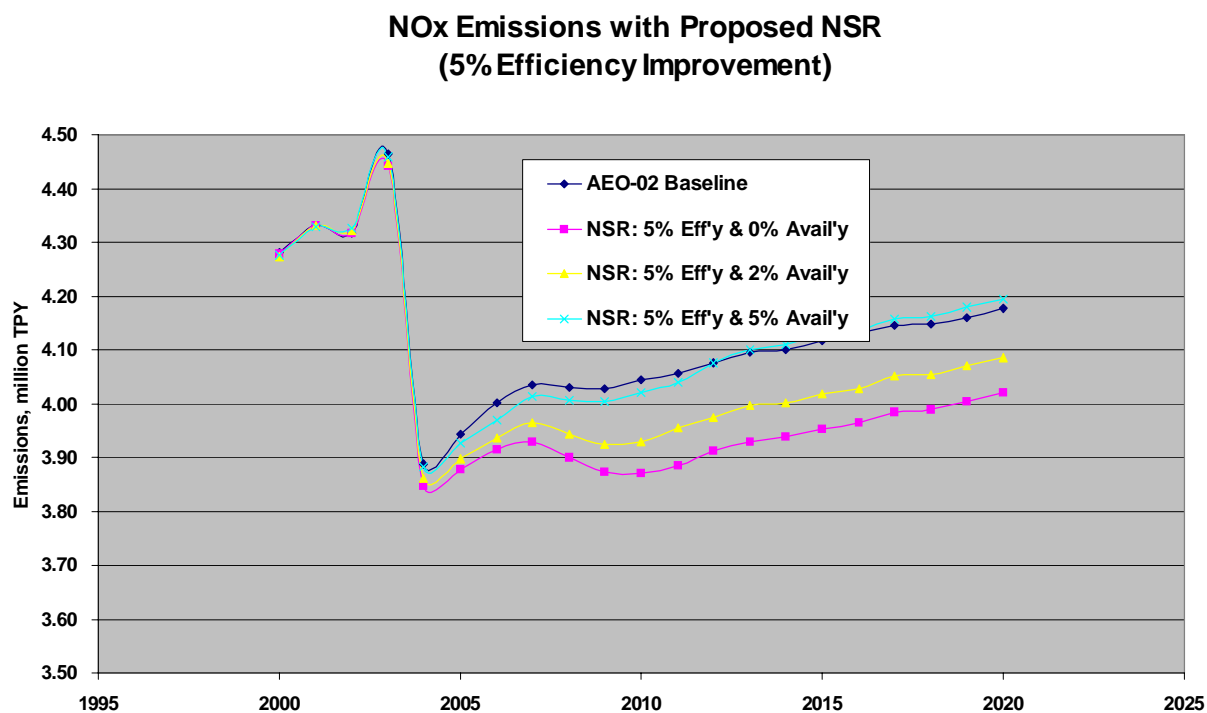


Figure 4



Unit Availability For Coal-fired Power Plants

Data on the causes of power plant outages is maintained by the North American Electric Reliability Council (NERC), and much of this data is accessible at their website

(www.nerc.com/~gads/). The top 25 causes of outages at coal units for the period 1996-2000 are presented in the table below.

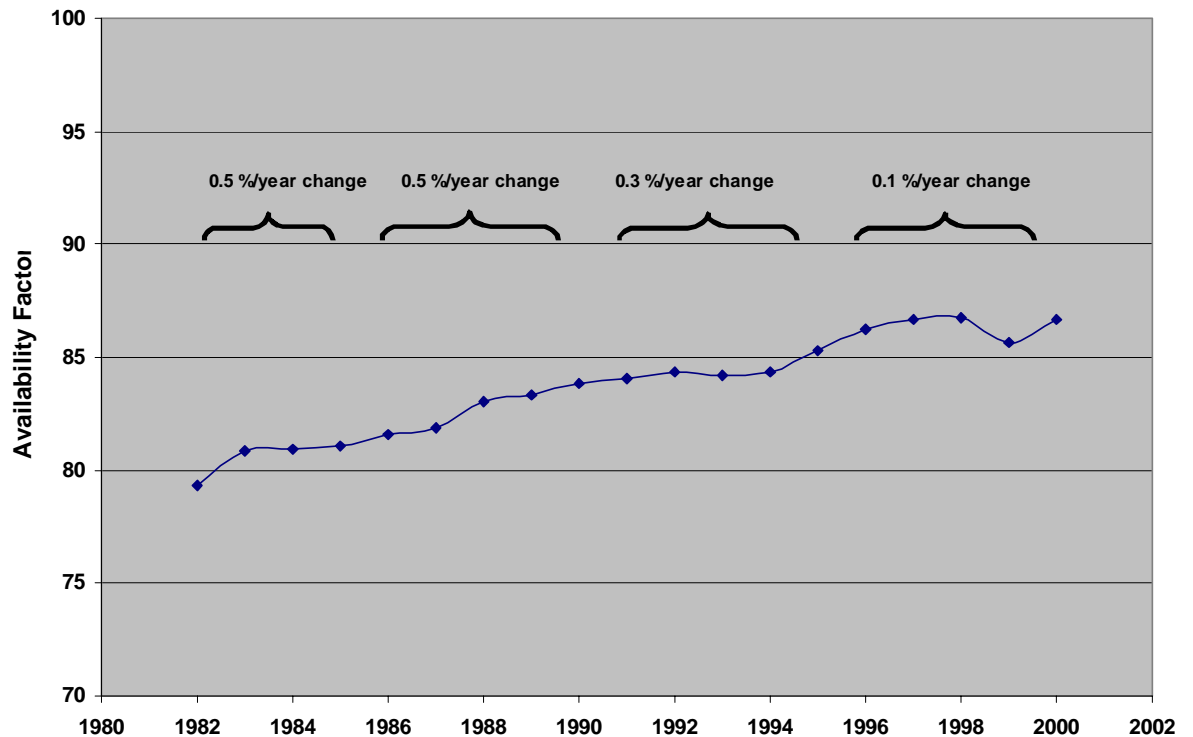
NERC GADS Data

Principal causes of outages or derating at coal units, 1996-2000.

AVG NO. OCC PER UNIT-YR	AVERAGE MWH PER UNIT-YR	AVERAGE MWH PER OUTAGE	SYSTEM/COMPONENT CAUSE
0.43	83,199	193,623	MAJOR BOILER OVERHAUL
0.33	60,765	185,529	SOOT BLOWERS - STEAM
0.21	41,527	196,080	MAJOR TURBINE OVERHAUL
0.57	40,013	70,047	PULVERIZER OVERHAUL
0.32	37,735	116,539	BOILER INSPECTIONS
4.95	35,785	7,223	PULVERIZER MILLS
1.83	30,202	16,499	FURNACE WALL LEAKS
1.16	22,949	19,738	FEEDWATER PUMP
0.92	19,642	21,386	PULVERIZER INSPECTION
1.83	19,509	10,645	ELECTROSTATIC PRECIPITATOR PROBLEMS
2.67	17,237	6,455	OTHER PULVERIZER PROBLEMS
0.7	15,695	22,336	HIGH PRESSURE HEATER TUBE LEAKS
0.96	14,959	15,604	BOILER, MISCELLANEOUS
6.44	13,821	2,146	OPACITY - FOSSIL STEAM UNITS
0.62	13,549	21,969	FIRST REHEATER LEAKS
0.57	13,138	23,097	REDUCED POWER TO AVOID SLAG/FOULING
0.29	10,475	36,353	ESP FIELD OUT OF SERVICE
0.48	10,337	21,454	SECOND SUPERHEATER LEAKS
3.89	9,689	2,489	PULVERIZER FEEDERS
0.39	9,207	23,397	BURNERS
0.53	8,005	15,126	PULVERIZER MOTORS AND DRIVES
0.55	7,930	14,483	FIRST SUPERHEATER LEAKS
0.51	7,571	14,713	ELECTROSTATIC PRECIPITATOR FOULING
0.02	7,502	324,107	SERVICE WATER PUMPS AND MOTORS
0.32	7,298	22,465	CIRCULATING WATER PUMPS

Grouping these problems by power plant section, it can be seen that about 75% are due to failures in the boiler or pulverizers, 17% due to turbine repair, and 7% due to parasitic power units (ESP, pumps, motors).

Coal Unit Availability (NERC)



The incidence of such problems has decreased over the past two decades, even though the average age of these power plants has increased, due to improved maintenance practices by plant operators. The figure below shows the average coal power plant availability (defined as the hours the unit could deliver power in a year, divided by the hours in a year, expressed as a percentage) since 1982.

Note that the rate of improvement in availability has dropped from about 0.5% per year in the early 1980's to 0.1% per year in the late 1990's. This is believed attributable to physical limits on

average fleet availability. These trends would suggest that even aggressive programs to improve availability cannot improve performance more than 1% (cumulatively) between 2000 and 2010. Hence, average availability might be expected to rise from 86% to 87% by 2010. In the absence of a rigorous methodology to attribute the portion of this future improvement to actions which would be considered "routine maintenance, repair and replacement" versus non-routine actions subject to permit restrictions or new source review limitations, one half of the increase could be assumed to be constrained by current NSR policy.

Given the uncertainty in predicting a change in availability, a range of changes was modeled using the NEMS modeling system. Even though less than a 1% increase in availability is expected, a range of 0 to 5% increase was modeled. An overview of the NEMS system is available at <http://tonto.eia.doe.gov/FTPROOT/forecasting/05812000.pdf>.

Potential for Efficiency Improvements At Existing Coal-Fired Power Plants

The average efficiency of the US fleet of coal-fired power plants was 33% in 2000, which equates to a heat rate (fuel energy needed to generate one kilowatt-hour of power) of 10,240 Btu/kwh. Possible measures to improve this efficiency have been investigated in recent years due to interest in fuel savings, as well as in the greenhouse gas emissions reduction (i.e., CO₂) which would accompany such a performance improvement. For example, see Integrating Consultancy - Efficiency Standards for Power Generation, Australian Greenhouse Office, Jan. 2000; Review of Potential Efficiency Improvements at Coal-Fired Power Plants, Perrin Quarles Associates, Inc., for Clean Air Markets Division, USEPA, April 2001; Increasing Electricity Availability From Coal-Fired Generation in the Near-Term, The National Coal Council, May 2001. The Department of Energy is currently studying such measures. Preliminary results from the DOE effort have highlighted several promising options, as indicated in the table below.

Table 2.1

Technology	% Efficiency Improvement	Concept
Turbine reblading	5-10%	Replace existing turbine blade sections and seals with more efficient computer-based designs.
Energy management	1-5%	Replace current power plant control system with real-time performance monitoring and adjustment of chemical feed rates, air flow, steam temperatures, outage maintenance against a theoretical model.

Intelligent soot blowing	1-2%	Replace current soot blowing system with "smart" systems, which can reduce steam use for soot blowing by 30%.
Distributed Control System controls	0.5-2%	Automate manual adjustment of air registers, burner tilt, fan power, etc., using an optimal computer "smart" system.
Generator exciter replacement	1-2%	Replace current mechanical exciter with a more efficient solid-state system.
Condenser enhancement	1%	Replace condenser with a larger unit to reduce back pressure and make steam turbine more efficient.
Overall improvements	8-17%	(Numbers are not additive due to some overlapping improvements, and possible double-counting.)

In general, these improvements all improve the efficiency of steam conversion to electricity, or reduce parasitic power consumption within the power plant. Such improvements in efficiency produce more power for the same amount of energy consumed, and therefore do not increase emissions, in and of themselves. However, two larger scale issues must also be considered.

First, if the increase in efficiency also improves the unit's economics, then the unit might be dispatched (used) more, while other units are used less. It is likely that voluntary efficiency improvements would improve unit economics. To further evaluate this situation, emission changes at a midwestern power pool for were evaluated for a range of hypothetical efficiency improvements in coal-fired units. Four hypothetical NGCC generating units were "added" to the system to reflect a future scenario in which a broader mix of coal and gas-fired units would probably exist. The analysis found that only a very large change in efficiency (13.5%, or greater) would be likely to change the relative dispatching of coal units with generically different units, such as natural gas-fired or nuclear units, and that even at such high levels of efficiency improvement, the net effect was a reduction in emissions of 3-4%. (10/19/2001 email from V. Koritarov, ANL, to D. Carter, USDOE) It would be

reasonable to expect some shifting in dispatching between other coal units, if all the units were not comparably improved. Such a change could result in an increase in emissions if higher emitting units were the subject of efficiency improvements. However, given emission caps for sulfur dioxide, caps in certain states for nitrogen oxides, and a tendency by power plant operators to achieve optimal performance (both efficiency and emissions) at their "flagship" units, it seems much more likely that units receiving the greatest efficiency upgrades would be the cleaner units. Under these circumstances, efficiency improvements of the type cited above would reduce emissions. In other words, if one expects a 10% overall improvement in efficiency at coal units, efficiency improvements of 12% might occur at the lowest emission units, and improvements of 8% at the highest emitting units. This behavior would lead to significant emission reductions in periods of "off-peak" generation, which includes the major portion of the year. However, this type of behavior is difficult to model and was not simulated in the model runs by ANL or EIA.

The second larger scale issue is that of demand growth. The growth in electricity demand over the next decade is projected to be greater than expected growth in electricity production due to efficiency improvements at coal-fired power plants. Another way of looking at this is that almost all additional generation which comes from efficiency improvements would be power not needed from new generators. Because the efficiency improvements are at existing coal units, whereas new generation over the next decade will be dominated by much lower emitting natural gas combined cycle units, one might suppose that the efficiency improvement would result in increased emissions overall. However, this is not the case. As long as the increased power production does not require additional coal consumption (which is the case for these efficiency improvements), then the resulting net emissions will be lower than the total emissions for "unimproved" coal plants and "super-clean" natural gas plants.

Most, but not all of the efficiency improving technologies cited in Table 2.1 reflect replacement components. This is important

to note because some NSR policies might apply differently to replacement parts versus new components added to a plant for the sole purpose of improving efficiency.

Given the expanding suite of efficiency improving technologies, and growing interest in reducing greenhouse gas emissions through efficiency improvements, it is reasonable to project overall efficiency improvements, in the absence of NSR constraints, as large as 10-15%. Such a range is much larger than conventional wisdom, which is perhaps shaped by expectations under the current NSR policy, and the absence of efficiency incentives related to climate change concerns. To cover a broad range of possible improvements, a range of 5% to 15% was examined using the NEMS modeling system.

APPENDIX B

EVALUATION OF ROUTINE MAINTENANCE MODEL SCENARIO FOR POWER PLANTS (ENVIRONMENTAL PROTECTION AGENCY)

EVALUATION OF ROUTINE MAINTENANCE MODEL SCENARIO FOR POWER PLANTS

Purpose: This analysis uses model scenarios to evaluate the impact that the changes to the routine maintenance provisions of NSR are likely have on emissions from the power generation sector.

Methodology: In order to evaluate the impact of the routine maintenance provisions, EPA considered a scenario under which NSR regulations remained in place and a range of scenarios that could occur if NSR did not exist. The first scenario is intended to represent the existing program, which the EPA has found impedes or results in cancellation of projects that maintain and improve reliability, availability, and efficiency at existing power plants.²⁰ The second range of scenarios represents companies receive flexibility under the NSR program that removes many of these impediments. As part of this analysis, EPA reviewed three key variables: change in SO₂ emissions, change in NO_x emissions and change in cost.

In the future, when a final rule is issued on treatment of routine maintenance under NSR, there will already be in place final rules governing the use of plantwide applicability limits (PALs), and Clean Units. Some sources within the electric utility generation industry may take advantage of these changes. However, any such decision will be based on case specific information related to their past operating levels, current levels of control and company's specific strategies for complying with NSR. Therefore, we can not make estimates on how many sources may take advantage of PALs and Clean Units. To the extent they are used within the industry, they will dampen the effects shown in this analysis (i.e., estimated decreases and increases will not be as large).

This analysis was performed using the Integrated Planning Model (IPM). IPM is a linear programming model that EPA uses to analyze the effect of various environmental policies on the power sector. It provides forecasts of least-cost capacity expansion, electricity dispatch and emission control strategies for meeting energy demand and environmental, transmission, dispatch and reliability constraints. EPA has used it to analyze many environmental policies including the Phase II Acid Rain Nitrogen Oxide regulations and the Nitrogen Oxide SIP Call. Analysis can be performed varying multiple constraints such as availability of various types of power plants (e.g. coal-fired, nuclear, gas-fired combined cycle units), heat rates of various types of power plants, environmental constraints (e.g. caps on emissions, emission rate limitations). More detail

20 This finding is described in detail in EPA's June 13, 2002 New Source Review Report to the President.

regarding IPM can be found in the document titled "Documentation of EPA Modeling Application (V.2.1) Using the Integrated Planning Model, which can be found at: <http://www.epa.gov/airmarkets/epa-ipm/index.html>.

Assumptions: The first scenario, referred to as the NSR base cases approximates utility behavior under the current program, where the EPA has found that companies perform limited maintenance on coal plants because of concerns about NSR. In this scenario, it was assumed that the performance of coal units would deteriorate, resulting in higher heat rates and lower capacities. EPA did not assume that reduced maintenance resulted in a change in maximum potential unit availability. This is because over the last 20 years, availability of coal-fired plants has increased even as the plants have aged. This is due in large part to improved maintenance practices. For instance tests to inspect boiler tubes have been continually improving (see "Preventing Boiler Tube Failures with EMAT's", S.P. Clark et al, "EPRI International Conference on Boiler Tube Failures and HRSG Tube Failures and Inspects", November 6-8, 2001). These improved preventive maintenance practices allow companies to replace components during regularly scheduled outages before they fail rather than causing unscheduled outages after they fail. The second range of scenarios, referred to as increased maintenance cases #1 - #5 , looks at a range of scenario for what might happen in the utility sector if companies were provided with increased flexibility under NSR to perform maintenance. This would result in lower heat rates, higher capacities and/or higher unit availabilities for these units. Finally EPA looked at one case (standard base case) in which heat rate, capacity and unit availability did not change.

Table 1: Key modeling assumptions in routine maintenance analysis

	Winter Availability	Summer Availability	Heat Rate Change	Capacity Change
NSR Base-case	81.6%	89.8%	+0.1% per year	-0.1% per year
Increased Maintenance Case #1	85.0%	92.0%	-0.1% per year	+0.1% per year
Increased Maintenance Case #2	81.6%	89.8%	-0.1% per year	+0.1% per year
Increased Maintenance Case #3	85.0%	92.0%	-1.6% in year 2005 and beyond	+1.6% in year 2005 and beyond

Increased Maintenance Case #4	85.0%	92.0%	-3.2% in year 2005 and beyond	+3.2% in year 2005 and beyond
Increased Maintenance #5	81.6%	89.8%	-1.6% in year 2005 and beyond	+1.6% in year 2005 and beyond
Standard Base Case	81.6%	89.8%	No change	No change

It is important to note several limitations to this analysis. First this analysis only considered emission regulations that are currently in effect (e.g. the NOx SIP Call and the Title IV Acid Rain Provisions). Future environmental regulations such as emission reduction requirements necessary to meet the fine particulate matter standards or emission reductions under multi-pollutant regulations could significantly change this analysis. Second, the analysis assumed the operating and maintenance costs of coal-fired units was the same for units performing limited maintenance and for units performing increased maintenance.. Since the most significant cost associated with running an existing power plant is the cost of fuel, this impact is probably fairly small.

Results:

Changes in SO2 Emissions, NOx emissions and cost are summarized in tables 2, 3 and 4 below.

Table 2: Changes in SO2 emissions in scenarios considered in routine maintenance analysis.

	2005 SO2 Emissions (tons)	2010 SO2 Emissions (tons)	2015 SO2 Emissions (tons)	2020 SO2 Emissions (tons)
NSR Base-case	10,168,230	9,713,684	9,101,622	9,103,275
Increased Maintenance Case #1	10,135,120	9,739,029	9,104,121	9,102,688
Increased Maintenance Case #2	10,186,660	9,701,112	9,099,363	9,099,271
Increased Maintenance Case #3	10,075,060	9,773,242	9,104,836	9,103,779
Increased Maintenance Case #4	10,009,250	9,813,664	9,105,429	9,104,396
Increased Maintenance #5	10,079,510	9,764,971	9,099,923	9,100,361
Standard Base Case	10,168,520	9,712,499	9,100,264	9,100,680

Art high-lighted three numbers, I double checked, they are right.

As shown in table 2, there is very little change in SO2 emissions over the entire time period studied under the two scenarios. This is because SO2 emissions are already capped nationally under the Title IV Acid Rain Provisions. Therefore if a unit decreases its emissions to make room under its PAL, it could instead sell excess allowances to another unit.

However because emissions can also be shifted temporally by banking emission allowances to be used in a future year there can be significant changes in emissions for a specific year. While temporal distribution of emissions did not change much over time in the NSR cases considered, there was more temporal distribution of emissions in the increased maintenance scenarios considered.

Table 3: Changes in NOx emissions in scenarios considered under routine maintenance scenarios.

	2005 NOx Emissions (tons)	2010 NOx Emissions (tons)	2015 NOx Emissions (tons)
NSR Base-case	4,279,362	4,285,400	4,338,461
Increased Maintenance Case #1	4,340,166	4,362,948	4,442,881
Increased Maintenance Case #2	4,276,550	4,283,081	4,327,979
Increased Maintenance Case #3	4,307,796	4,350,737	4,423,141
Increased Maintenance Case #4	4,276,172	4,334,671	4,412,340
Increased Maintenance #5	4,259,170	4,271,294	4,324,992
Standard Base Case	4,277,407	4,285,423	4,332,209

Increasing capacity (under the increased maintenance cases) leads to increases in NOx emissions. When comparing increased maintenance cases #1 and #2 (which had the same increases in efficiency, but different changes in maximum availability, NOx emissions increase by an average of almost 92,000 tons per year over the time period analyzed.

It appears that changing heat rates and capacities has the opposite affect on emissions.. NOx emissions actually decrease when flexibility under NSR allows power generation companies to improve efficiency by performing increased maintenance if maximum availability of these units does not change at the same time. For instance if one compares two scenarios with the same maximum capacities: NSR Base-case , increased maintenance case #2 and the standard base case, average emissions are about 7000 tons per year higher over the time period analyzed in NSR Base-case where heat rates are higher and capacities are lower. Looking at increased maintenance cases #3 and #4 shows the same trend. In these two cases maximum availability remains constant, but heat rates are lower and capacities are higher in increased maintenance case #4. These lower heat rates and higher capacities lead to emissions that are on average nearly 18000 tons per year less in increased maintenance case #4 than in increased maintenance case #5.

Another point to note is that EPA also looked at the speed in which the improvements to the units were made. For example by 2020, the heat rate decrease and the capacity increase was the same in both increased maintenance case #2 and increased maintenance case #5 were the same. However in case #5, those changes happened in one step in 2005, in case

#2, the changes happened gradually. When the changes occurred all at emissions were lower in the early years. In the later years, when the total magnitude of the changes was more similar in both cases, the NOx emissions were also more similar.

This analysis suggests that the affect that changing the requirements of NSR with regards to routine maintenance will have on emissions is dependent upon the affect that it will have on maximum unit availabilities.

If the routine maintenance changes increase efficiency and plant capacity without increasing maximum unit availability, this analysis suggests that the changes could decrease emissions. The amount of that emission decrease would depend both on how much heat rate decreased and capacity increased and how quickly these changes occurred. The greater the heat rate decrease and capacity increase and the more quickly the changes occurred, the greater the emission reductions. If on the other hand, the new provisions increase maximum unit availabilities this analysis suggests that the changes could increase emissions.

Changes in cost are summarized in table 4 below. Note that this analysis does not consider changes in maintenance costs, it only assumes changes in fuel costs and changes in capital costs associated with new generating units and new emission control equipment. Therefore it probably understates the cost of the increased maintenance scenarios and understates the cost of the NSR Base-case.

Table 4: Total cost of scenarios considered (in 1999 dollars)

	2005 Total Cost (million 1999 dollars)	2010 Total Cost (million 1999 dollars)	2015 Total Cost (million 1999 dollars)
NSR Base-case	76,187	80,934	88,921
Increased Maintenance Case #1	75,432	79,819	87,306
Increased Maintenance Case #2	76,088	80,290	87,861
Increased Maintenance Case #3	74,422	79,309	86,715
Increased Maintenance Case #4	73,740	78,250	85,898
Increased Maintenance #5	75,164	79,782	87,600
Standard Base Case	76,149	80,572	88,404

For more detailed results, see the attached I'M run summaries. The runs are listed in table 5 below.

Table 5: I'M Runs used in this analysis

Scenario	I'M Run #
NSR Base-case	NSR-13
Increased Maintenance Case #1	NSR-8
Increased Maintenance Case #2	NSR-11
Increased Maintenance Case #3	NSR-14
Increased Maintenance Case #4	NSR-15
Increased Maintenance #5	NSR-16
Standard Base Case	IPM2000s100d